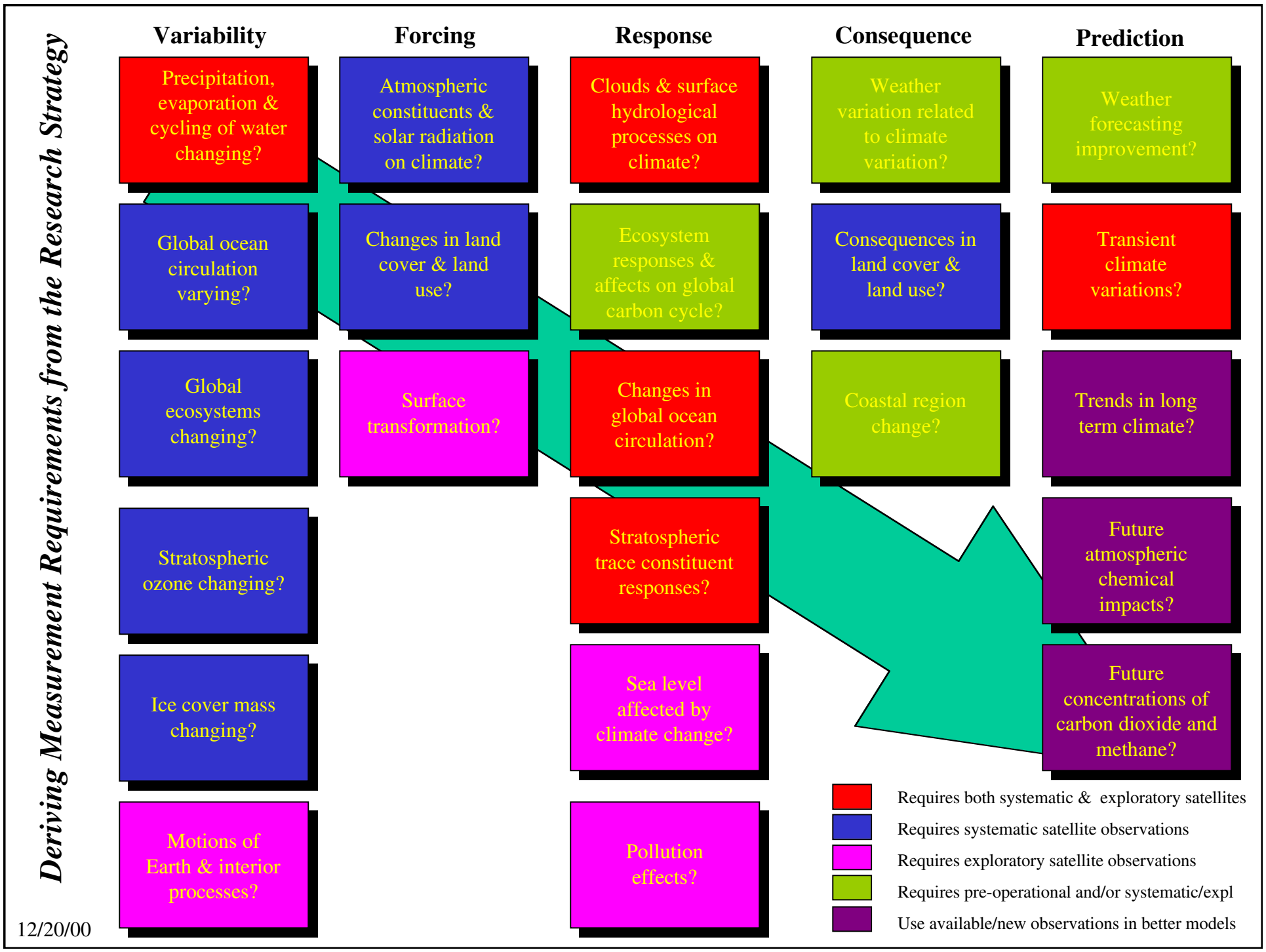
Office of Earth Science

NASA

Update to the Technology Strategy Team

Granville Paules
8 May 2001


Deriving Measurement Requirements from the Research Strategy
Variability
Forcing
Response
Consequence
Prediction
Precipitation, evaporation & cycling of water changing?
Atmospheric constituents & solar radiation on climate?
Clouds & surface hydrological processes on climate?
Weather variation related to climate variation?
Weather forecasting improvement?
Global ocean circulation varying?
Changes in land cover & land use?
Ecosystem responses & affects on global carbon cycle?
Consequences in land cover & land use?
Transient climate variations?
Global ecosystems changing?
Surface transformation?
Changes in global ocean circulation?
Coastal region change?
Trends in long term climate?
Stratospheric ozone changing?
Stratospheric trace constituent responses?
Future atmospheric chemical impacts?
Ice cover mass changing?
Sea level affected by climate change?
Future concentrations of carbon dioxide and methane?
Motions of Earth & interior processes?
Pollution effects?
Requires both systematic & exploratory satellites
Requires systematic satellite observations
Requires exploratory satellite observations
Requires pre-operational and/or systematic/expl
Use available/new observations in better models
12/20/00

Missions in Development/Formulation

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EOS-Era Missions to be launched FY01

- AQUA
- SAGE III
- JASON
- QuikTOMS

EOS-Era Missions to be launched FY02 - FY04

- ICESat
- GRACE
- SORCE
- Seawinds/ADEOS II
- TRIANA
- AURA
- GIFTS (NMP EO-3)
- PICASSO-CENA
- CLOUDSAT
- SAGE III - ISS

Missions in formulation FY01-03

- NPOESS Preparatory Project ("Bridge Mission")
- Landsat Data Continuity
- Global Precipitation
- Ocean Winds
- Ocean Topography
- Solar Irradiance
- Total Column Ozone
- Next ESSP

Trop Winds & Global Earthquake under study in FY01

Formulation Authorization Development Schedule

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Formulation Authorization	Draft for ESE Review	AA Signature
NPP	10/98	11/6/98
LandSat Data Continuity	8/4/00	8/24/00
Global Tropospheric Winds	8/4/00	8/24/00
Earth Exploratory	8/7/00	8/9/00
GOES ABI		8/4/00 8/9/00
UNESS	1/99	2/1/99
Global Precipitation	1/2/01	
Ocean Surface Winds	TBD	
Ocean Surface Topography	TBD	
Solar Irradiance	TBD	
Total Column Ozone	TBD	

Advanced Technology: develop key technologies to enable our future science missions. Includes NMP, Instrument Incubator, HPCC, Advanced Technology, Advanced Info System Technology

Developing advanced technology for the acquisition and dissemination of Earth science data & information

Technology Emphasis Areas

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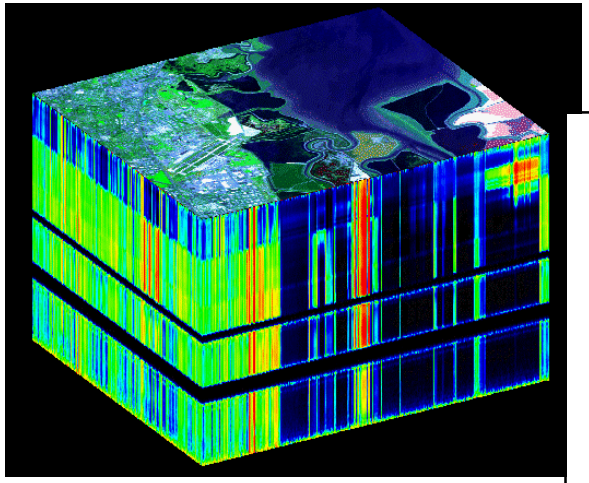
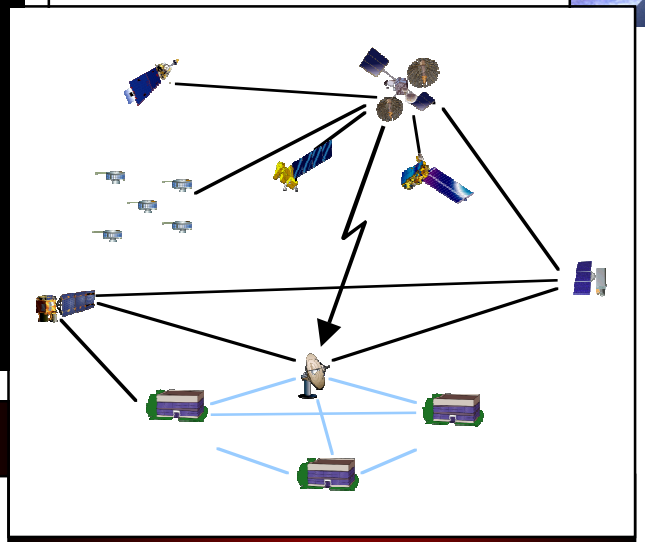
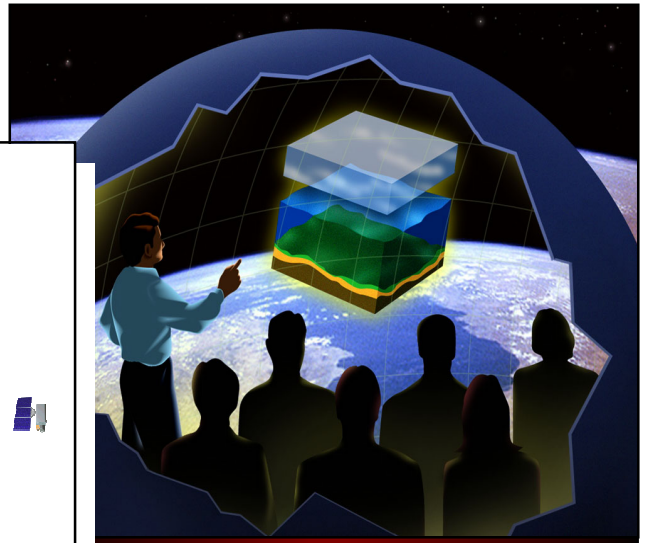
Earth System Science in the future will leverage three ongoing technology revolutions:



Geospatial



Communications



Computing

...To enable timely and affordable delivery of Earth Science data and information to users

Advanced Technology - Implementation Approach and Achievements

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- Open competitive Solicitations
  - Instrument Incubator, Adv. Tech Initiatives and Adv. Info Systems: 80 Awards
  - Broad Participation:
    - NASA (43), Academia (15), Industry (15), Labs/Other Agencies (7)
- Highlights:
  - Delay/Doppler Radar Altimeter

  Completed local and Greenland demo flights

  Future NASA/IPO Infusion
  - High Altitude MMIC Sounding Radiometer (HAMSR)

  World's 1st Fully Functional MMIC-based sounder

  Future Aqua Validation and CAMEX-4 flight
- Technology Infusion:
  - High Speed Digital Demodulator ASIC

  Implements JPL/GSFC parallel processing algorithm

  Will be used in NPP In-situ User Terminals

Advanced Technology - Implementation Approach and Achievements (cont.)

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Earth Observing-1 (EO-1) in orbit

Technology space flight validation mission to ensure cost effective Landsat data continuity beyond Landsat 7 through the use of advanced technology:

- Multispectral imaging capability next generation Landsat imager , no moving parts, 77% less mass than ETM+, less power, 6-10 times better S/N, scaleable design to full instrument.
- Hyperspectrsal imager to support advanced capabilities for land remote sensing research community
- Atmospheric corrector (hyperspectral) to compensate for intervening atmosphere on multispectral data
- Advanced spacecraft technologies to provide enhanced capabilities for future Earth Science missions

Earth Observing-3 (EO-3) in Formulation

Technology space flight validation project to validate breakthrough technologies that enable an advanced GEO-based class of atmospheric sounders and imagers: greatly improved weather forecasts by measuring the horizontal and vertical flux of water vapor; and demonstrate atmospheric chemistry studies of radiatively active trace gasses from a geostationary vantage point:

- Combine measurement technologies of Fourier Transform Spectrometry (FTS) with large-area focal plane arrays utilizing active cooling and on-board digital processing
- Planned as Tri-Agency partnership between NASA, Department of the Navy, and NOAA
- Mission Confirmation Review - Spring 2002, Launch Readiness - Winter 2004

Advanced Technology - Implementation Approach and Achievements (cont.)

NASA

High Performance Computing and Communication

Near Term Progress

- Met 1995 Grand Challenge performance metrics,.e.g.
  - 100gflops sustained throughput,
  - or 200X processing speed increase over 1992 model performance
- Acquired high performance Silicon Graphics parallel processing computer
  - Joint GSFC/ARC testbed for ES models

New Activity

- Major conceptual move toward advanced, integrated computing architectures
- Next Major Development Cycle focused on balanced hardware/software utilization
  - NASA Cooperative Agreement Notice--Sep 2000
  - $18 million over three years--up to eight awards
  - 45 letters of intent received

Earth Science Vision Rollout

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- **Science Team being formed**
  - Formation being led by Dr. Franco Einaudi/GSFC
  - Will refine long range, visionary science drivers
- **Applications Studies in definition**
  - Economic Benefits Study underway
- **Technology Challenges being refined**
  - Includes link to broader agency plan
- **'Rollout' at IGARSS 2001 in Sydney**
  - Session One
    - Science drivers and technology challenges
    - Greatly enhanced computer video of candidate architectures
    - Panel discussion with senior space agency executives
  - Session Two
    - Ten papers covering candidate advanced technologies

TST Organization

NASA

- **Terms of Reference**
- **Membership**
  - Relationship to ESE Program Organizations
  - Support to BiMonthly Program Reviews